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Serial No. 10/601,030
Attorney Docket No. RA-5482
Examiner Brian R. Peugh, Group Art Unit 2187

SEP 06 2006

Office Action Response
September 6, 2006**BEST AVAILABLE COPY****Remarks**

In the Office Action dated June 7, 2006 ("Office Action"), Claims 1, 2, 4-6, 12-16, 19-24, 29-32 and 34-36 were rejected and Claims 3, 7-11, 17, 18, 25-28, 33 and 37 were objected to. In the Amendment set forth above, Claims 1, 12, 20, 29, and 34 are amended and the remaining Claims are unchanged. In view of the amendments to the Claims and the comments set forth below, it is respectfully submitted the Claims are in condition for Allowance.

1. Claim 14 was objected to for failing to provide proper antecedent basis for the phrase "other linked request" in line 6. It is believed this objection was inadvertently maintained from the previous Office Action dated 12/29/2005. In response to that previous Office Action, an amendment submitted March 21, 2006 inserted the word "any" before the subject phrase in line 6 of Claim 14, as shown in the above Claim set. If this objection is not withdrawn, more clarification is requested regarding this objection.

2. Claims 1, 2, 4-6, 12-16, 19-24, 29-32, and 34-36 were rejected under 35 USC §103(a) as being unpatentable over U.S. Patent No. 6,434,641 to Haupt et al. ("Haupt") in view of U.S. Patent No. 6,973,550 to Rosenbluth et al. ("Rosenbluth"). This rejection is respectfully traversed.

First, Claim 1 is considered. As amended, Claim 1 now recites that if multiple requests are requesting the same data, a respective linked list is created to record those requests. This linked list is created without regards to types of the requests. (Claim 1 step b.) That is, a determination as to whether to add a request to a linked list is not based on the type of the request. This type of operation is described throughout Applicants' Specification. As one example, Applicants' Specification states:

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Before a request for a cache line can be presented to SCD 100, cache control logic 202 forwards information associated with the cache miss to Local Tracker (LT) control logic 203. LT control logic creates a request entry for the request within a storage device referred to as Local Tracker (LT) 212....[E]ach LT entry includes a link field 228 that is provided to link the current LT entry to any subsequently created entry associated with a request for the same cache line. In one embodiment, the link field may be set to the index value that identifies a latter-created LT entry, as will be described below. Requests are linked in this manner to order the requests for the same cache line according to time-order. (Specification page 14 lines 28-31 and page 15 lines 17-22.)

The foregoing passage describes that according to Applicants' invention, any request that is directed to a same cache line in main memory (i.e., the SCD) as one or more previously-issued pending requests is added to the LT and linked to one of these previous requests. This occurs without regard to request type. This linking of all types of requests in this manner prevents memory thrashing and the occurrence of deadlock scenarios. (Applicants' Specification page 6 lines 16-17.)

In contrast to Applicants' mechanism for linking requests, the mechanism is Haupt is request-type dependent as follows:

"Certain types of requests, including fetch requests for requesting read data from memory, are further provided to Defer CAM Logic...the address signals associated with any fetch request are always compared to the address signals associated with every valid request stored within CAM 702....a favorable comparison occurs when the address signals of the current request are the same as the address signals associated with any request stored in CAM 702. When this occurs, the current request is linked via the address link stored in Field 718 to the CAM address storing the most recent of the other requests." (Haupt column 13 lines 34-36, column 18 lines 61-64, column 19 lines 9-11 and 19-21, emphasis added.)

Thus, in Haupt, only fetch requests need be linked to other requests. Haupt therefore does not teach Applicants' mechanism described in amended Claim 1 that links requests irrespective of request type.

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Rosenbluth, like Haupt, does not teach a mechanism for linking requests irrespective of request type. Rosenbluth teaches linking only fetch requests that are soliciting the same data as a previously-issued pending write request, as follows:

"...the controller 108 can implement logic that identifies when a read command requests memory addresses to be accessed for a queued 114 write command." (Rosenbluth column 2 lines 32-34.)

This is reiterated in Rosenbluth as follows:

"As shown in FIG. 8, for received 152 read commands, a process 150 determines 154 the bucket(s) associated with the read and determines 156 whether the bucket(s) correspond to a bucket associated with a queued write command. If so 158, the process 150 can queue 162 the read command with a link to a write command that should be issued to memory before the read command." (Rosenbluth column 6 lines 17-20.)

Thus, Rosenbluth, like Haupt, does not teach, or even suggest, a mechanism for creating a linked list of requests without regard to types of requests.

In addition to the foregoing, there is no motivation to make the cited combination of references. The Examiner states that one would be motivated to modify the request linking system of Haupt with the linking system of Rosenbluth because then the retrieval of future data will be coherent. (Office Action page 4 line 4.) However, the Haupt system utilizes a directory and the associated directory logic to maintain data coherency. (See, for example, Haupt column 14 lines 11-12 and the description of the directory logic 628 of Figure 6.) Thus, the Haupt system does not require any additional request linking mechanism of a type described by Rosenbluth or any other reference to maintain data coherency. For at least this reason, there is no motivation to combine any aspect of Rosenbluth with Haupt.

Further to the foregoing point, there is no motivation to combine any aspect of the Rosenbluth linked list with the linking mechanism of Haupt for at least the following additional reasons:

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a.) The Haupt linked list serves an entirely different purpose than any linking of requests performed by Rosenbluth. In Haupt, the linking of fetch requests is performed "... [t]o improve system performance by preventing the presentation of the subsequent request [for the same data] to MCL 235A...". (Haupt column 18 lines 60-61.) In contrast, the Rosenbluth system links requests to ensure that a read request does not by-pass an earlier-issued write request for the same data such that data coherency is not maintained. (Rosenbluth column 2 lines 56-63.) Thus, the purpose of request linking in Haupt is entirely different from that described by Rosenbluth.

b.) In Haupt, the fetch requests are linked to a previously-issued request for the same data. The previously-issued request may be another fetch request or an I/O overwrite request. (Haupt column 16 lines 24-29.) In contrast, within the Rosenbluth system, a fetch is always associated with a previously-issued write request. (Rosenbluth column 3 lines 8-10.) Thus, the types of requests that are being linked in Haupt are different from those being linked in Rosenbluth.

In view of the foregoing, one skilled in the art would not be motivated to make the cited combination of references for at least the following reasons:

- a.) The Haupt system maintains data coherency through the use of directory logic and does not require any additional mechanism such as any aspect of the Rosenbluth request linking system to maintain coherency;
- b.) The linking of requests in Haupt is done for an entirely different reason than in Rosenbluth; and
- c.) The linking of requests in Haupt is done in an entirely different way than in Rosenbluth and by linking different types of requests than are linked in Rosenbluth.

For at least the foregoing reasons, one skilled in the art would not be motivated to make any attempt to combine aspects of the Rosenbluth request linking mechanism into the system of Haupt. Doing so would not serve a useful purpose, and it is unclear if, or how, such a system would even operate.

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To summarize, amended Claim 1 is allowable over the current rejection for at least the reasons that Claim 1 describes a system wherein linking of requests is accomplished without regard to request type. None of the cited references teach or suggest this aspect of the invention. Moreover, no motivation exists to make the cited combination of references, and a prima facie case of obviousness has therefore not been presented. Thus, Claim 1 is allowable over the current rejection, which is improper, and should be withdrawn.

~~Claims 2 and 4-6 depend from Claim 1, and are allowable for at least the reasons set forth in regard to Claim 1. These Claims include additional aspects not taught or suggested by the cited combination of references.~~

Independent Claim 12 has been amended to include aspects of Applicants' invention that are similar to those discussed above in regard to Claim 1. For at least reasons that are similar to those discussed above with respect to Claim 1, Claim 12 is allowable over this rejection.

Claims 13-16, and 19 depend from Claim 12, and are allowable for at least the reasons set forth in regard to Claim 12. These Claims include additional aspects not taught or suggested by the cited combination of references.

Independent Claims 20, 29 and 34 have been amended to include aspects of Applicants' invention that are similar to those discussed above in regard to Claim 1. For at least reasons that are similar to those discussed above with respect to Claim 1, these Claims are allowable over this rejection.

Claims 21-24, 30-32, and 35-36 depend from a respective one of independent Claims 20, 29, and 34 and are allowable for at least the reasons set forth in regard to Claim 1. These Claims include additional aspects not taught or suggested by the cited combination of references.

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3. Applicants' appreciatively acknowledge the indication of allowable subject matter with respect to Claims 3, 7-11, 17, 18, 25-28, 33, and 37. In view of the amendments and comments set forth above, it is respectfully submitted that all Claims are now in condition for allowance.

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Conclusion

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Respectfully submitted,

Beth L. McMahon 9/6/2006
Beth L. McMahon
Attorney for Applicants
Reg. No. 41,987
Tele No. (651) 635-7893

Unisys Corporation
M.S. 4773
P.O. Box 64942
St. Paul, MN 55164-0942

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